PATENT SPECIFICATION

644463

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Index at acceptance:—Class 39(iii), H(2b2: 3e1).

COMPLETE SPECIFICATION

Improvements in or relating to Tubular Electrodes

We, SOCIETE ANONYME VETRERIA ITALIANA BALZARETTI MODIGLIANI, of Via Delle Cateratte, Livorno, Italy, an Italian Company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in tubular electrodes, especially for electric furnaces and for the manufacture of glass and in particular for electric furnaces for the production of glass fibres.

The present invention deals with improvements in the above electrodes for the purpose of regulating the temperature in such a manner as to hold the same within such limits as to preserve the materials which form the electrodes.

According to the present invention a hollow electrode of a cylindrical or other shape, which may be made of metal, for example steel, is provided in the interior with a coaxially arranged hollow body within which a cooling fluid is circulated without coming into contact with the inner surface of the electrode, and with an insulating material capable of withstanding the working temperature, and occupying the space between the wall of the electrode and the inner body.

The outside of the electrode may be covered by a good conducting material which will be variable according to the glass quality to be obtained; e.g. for common green glass no covering need be used, for glasses of better qualities a graphite covering may be suitable, whilst for higher qualities of glass the covering may be of non-corrodible alloys or of precious or noble metals suited to the purpose as for instance of platinum, of stainless steel alloys or the like.

The covering may be suitably applied on the body of the electrode by providing the body with ribs or by means of screw threads, for the purpose of permitting the thermic expansion play between the parts made of different material while allowing a good and maximum contact surface between each other both for a thermic and electric transmission.

The present invention is described by way of example with reference to the accompanying drawings which show a specific embodiment of the invention, and in which:—

Figure 1 is a longitudinal view of the hollow electrode and a partial section of the same;

Figure 2 is a cross-section on the line A—A of Figure 1;

Figure 3 shows the same electrode as in Figures 1 and 2 but with an overlapping covering which is applied to the steel electrode;

Figure 4 is a cross section on the line B—B of Figure 3;

Figure 5 shows another system of settling a graphite or the like covering by means of buttress threads on the steel covering;

Figure 6 is a cross section of Figure 5.

In all the Figures like numerals are used to denote like parts:—

1 is the tubular covering of the electrode and is composed of suitable metallic material, 2 is a tube that is coaxially placed inside the tube 1, its diameter being a little smaller than that of tube 1 in order to have an annular interstice 3 which is suitably filled by insulating refractory material capable of withstanding the working temperature.

In the tube 2 is introduced a small tube 4 secured at one end within the closing head 5 of the tube 2 whilst at the other end it discharges freely into the tube 2 in the proximity to the closure 6. The cooling liquid enters at 7 into the circulation tube 4, flows out at 8 and returns along the path 9, 10 in contact with the inside surface of the tube 2 and is discharged through a drain pipe 11.

12, 13 are two terminals for taking off

[*Price 2/-*]

the current, fed to the electrode, via a metallic arm 14 which serves as a support for the tubular cover 1.

15 is an air hole provided with a plug.

The sections of the body 1 and those of the bodies closed therein as well as the longitudinal layout may however be provided in a different manner. For example, the outside surface of the body 1 may be undulated in order to increase the thermo-electric transmission surface whilst the dissipation of heat will avoid the overheating of the electrode.

In Figures 3 and 4 there is a graphite covering sleeve 16, the good electrical contact of which with the tubular jacket 1 is assured by longitudinal ribs 17 on the outside of the body 1. The graphite covering sleeve 16 is applied to the body 1, namely on the edges 17, by a light constraining and scratching. In order to facilitate this mounting both surfaces which have to enter in close contact will be slightly conical either of the same or of slightly different conicity. The interstices may be filled with mouldable material of good electrical and thermal conducting properties.

Another method of mounting the covering sleeve 16 on the body 1 is illustrated in Figures 5 and 6 where a buttress thread 18 is formed on the body 1 and adapted to be screwed on the female thread of the covering 16.

The covering 16 may consist of non-corrodible alloys or of precious or noble metals. Unconditionally necessary is the manner of engaging the covering 16 on the body 1 inasmuch as the more or less different coefficients of expansion of the materials employed for the covering 16 and the body 1 are to be held in consideration in order to assure not only a good electrical contact but also a good thermal transmission. The graphite covering will for instance assure the melted glass from eventually taking up tones of colouring deriving from the material which composes the body 1 if the same was in direct contact with the mass of melted glass. Also a protecting but inseparable covering may be foreseen.

As the disclosure has been described and represented merely as an example it is well understood that numerous modifications may be made without departing from the invention.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Improvements in hollow electrodes, in particular metallic electrodes, for furnaces for the manufacture of glass, characterised in that, for the purpose of regulating the electrode temperature in such a way that it is held always within limits necessary to preserve the material of which the electrode is composed, the electrode, which is cylindrical or otherwise shaped, is provided in the interior with a coaxially arranged hollow body within which a cooling fluid is circulated without coming into contact with the inner surface of the electrode, and with an insulating material capable of withstanding the working temperature, and occupying the space between the wall of the electrode and the inner body.

2. Improvements in tubular electrodes according to the preceding claim, comprising a tubular jacket (1) inside which a tube (2) is coaxially located, the diameter of said tube being a little less than that of said jacket, the interstice between the said jacket and tube being filled with insulating material, for instance asbestos wool, whilst into said tube is inserted another small tube (4) which is sealed at one end to the exterior closing head of the said tube and at the other end discharges freely in such a manner that the cooling fluid can circulate along a path in contact with the inside wall of the tube (2) and be discharged through a drain pipe (11).

3. Improvements in tubular electrodes according to claim 2, characterised in that in the said jacket an air hole having a plug is provided.

4. Improvements in tubular electrodes according to any one of the preceding claims, characterised in that the body of the electrode is made of steel and is covered on the outside with an interchangeable covering of material of good electrical conductivity which may be varied according to the variety of glass that is to be obtained, as for instance for colourless glass the covering may be of graphite, for common green glass the electrode may be used without a covering, whilst for higher qualities of glass a covering of non-corrodible alloys or precious or noble metals may be employed, as for instance stainless steel, platinum or others.

5. Improvements in tubular electrodes according to claim 4, characterised in that for the purpose of assuring a good thermal transmission between the electrode outside and its covering material of good electrical conductivity, having regard to the difference of the respective thermal expansion coefficients between the electrode material and the covering material, the latter is mounted on the electrode either by making both parts or surfaces which are to come into contact of slightly

conical form, or by providing the electrode steel surface with longitudinal ribs and mounting the covering thereon by a light constraining and scratching, or by a combination of both methods, the interstices being filled with thermally and electrically conducting material, the whole in such a way as to permit the promiscuous use of the same electrode either with or without covering according to the special colouring or colourlessness of the glass mass which is to be produced, as these colour tones may derive from the same material composing the outside surface of the electrode.

6. Improvements in tubular electrodes according to claim 4, characterised in that the covering of graphite or of stainless steel, platinum, precious or noble alloys is provided with a thread which will engage with a corresponding thread provided on the outside of the electrode.

7. Improvements in tubular electrodes according to any one of the preceding claims, characterised in that the electrode, e.g. of steel or the like, instead of having a smooth cylindrical surface, is provided with an undulated surface for the principal purpose of increasing the heat dispersion as well as the electrical and thermally transmitting surface to the glass mass when the electrode is used without covering, which exterior roughness of the electrode may be combined with the conditions of a good adherence between the steel electrode and its covering, or else the roughness may establish the only means of assuring a good adherence, that is to say good electro-thermal transmission between the said surface in contact of the materials which have different thermal expansions.

8. Improvements in metallic tubular electrodes for melting furnaces especially for the production of glass wool, substantially as hereinbefore described with reference to the accompanying drawings.

Dated the 29th day of December, 1947.

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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig.1.

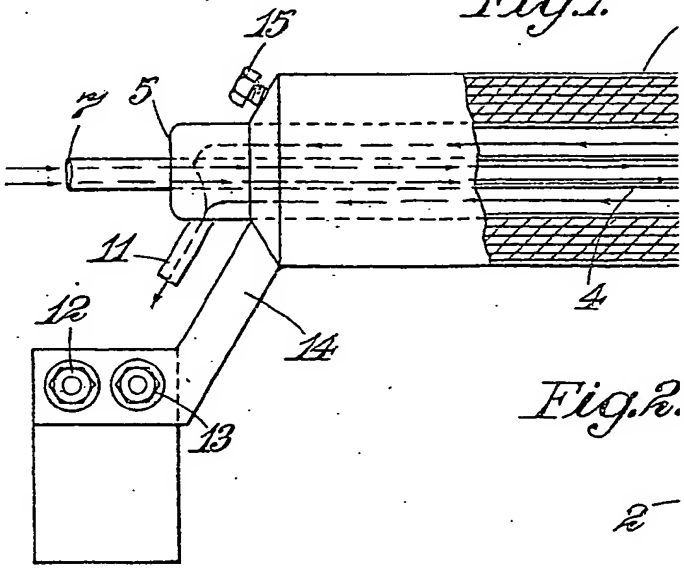

Fig.2.

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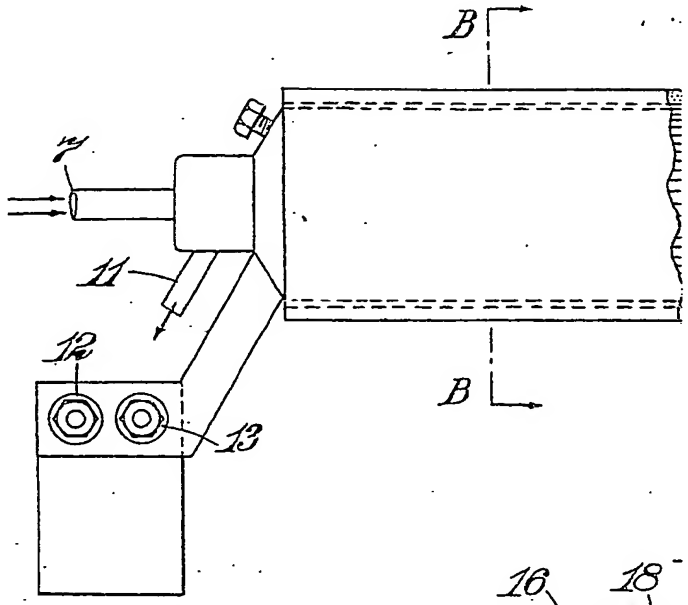
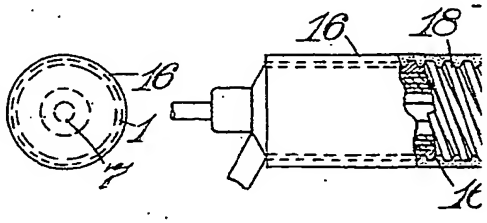


Fig.6.



2 SHEETS

SHEET 1

Fig.1.

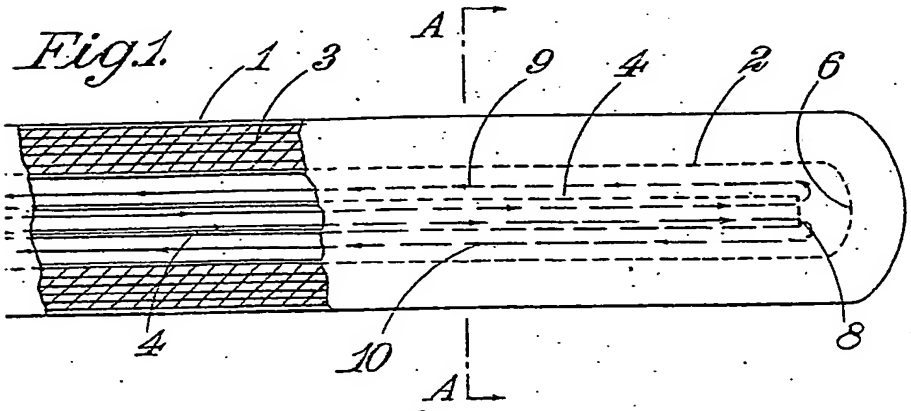
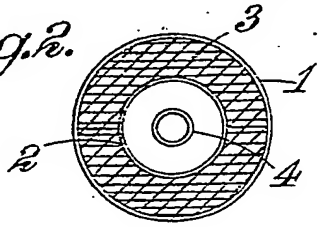


Fig.2.



SHEET 2

Fig.3.

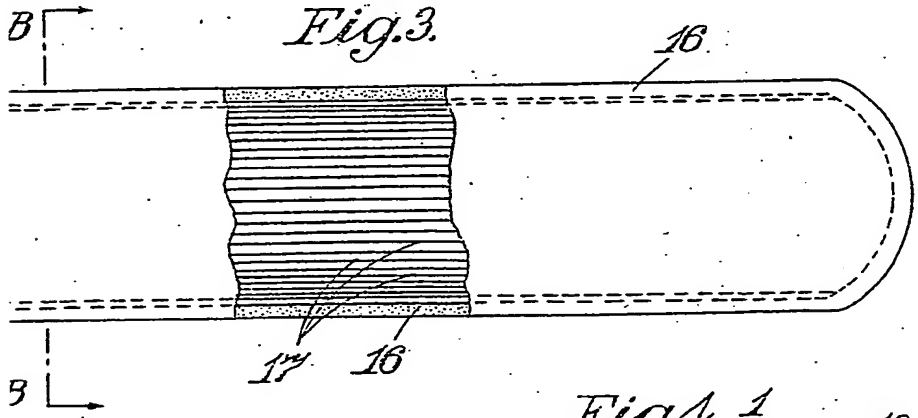


Fig.4.

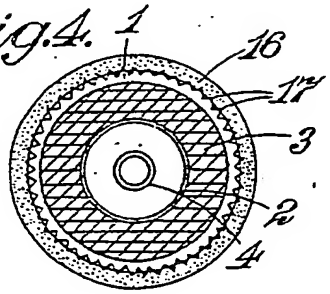
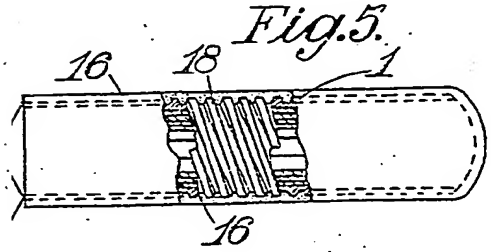


Fig.5.



H.M.S.O. (Ty. P.)

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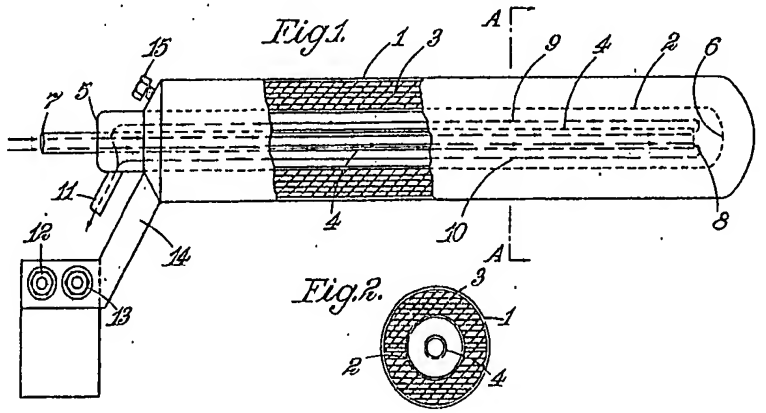
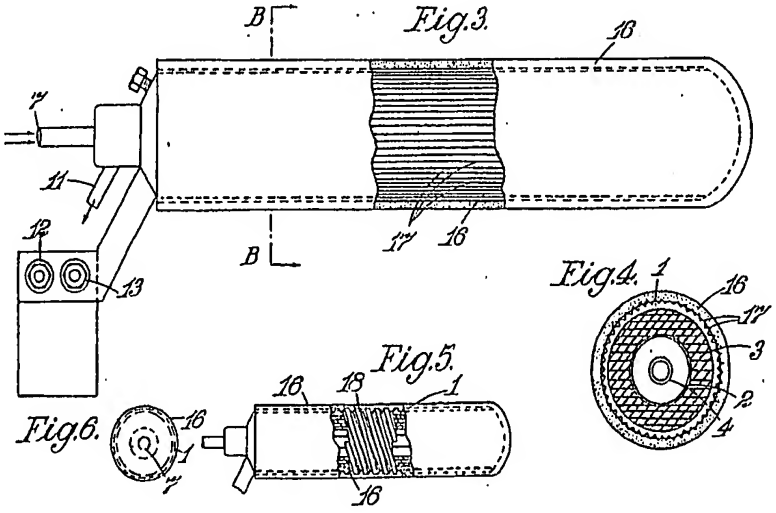
2 SHEETS

SHEET 1



SHEET 2



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H.M.S.O.(Ty. P.)